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ABSTRACT

Our recent survey of the Alabama River (river miles 22.9 – 72) for fishes has revealed the presence of Gulf Menhaden in extremely large numbers throughout the study area. Historical records of this marine species are confined to coastal areas. Typically this species migrates to open Gulf waters in the winter and spring for spawning. Our samples suggest that large numbers of young adult Gulf Menhaden migrated up the Alabama River instead, where we found them in both summer and fall samples. We also collected Gulf Menhaden during day and night samples on sand/gravel bars. The presence of larval individuals in our samples suggests that spawning may have occurred in the river. The presence of this planktivorous fish in such large numbers has the potential to profoundly affect the aquatic ecosystem of the Alabama River, and needs to be monitored.

INTRODUCTION

Gulf Menhaden (*Brevoortia patronus* Goode), is a marine species common to the central Gulf of Mexico (Hoese and Moore, 1977; McEachran and Fechhelm, 1998). The species forms large schools near the surface that support purse seine fisheries throughout the Gulf of Mexico. The Gulf Menhaden fishery is one of the largest by weight and most valuable in the United States (Christmas et al., 1982; Ross, 2001; Vaughan et al., 2000). This commercially important species is tolerant of a wide range of salinities, and can be found from offshore areas of the Gulf of Mexico to the lower reaches of major Gulf drainages, including the Tombigbee and Tensaw Delta (Lassuy, 1983; Mettee et al., 1996; Ross, 2001; Boschung and Mayden, 2004). Typically, spawning takes place in open waters of the Gulf in fall and spring (Ahrenholz, 1991). After hatching from pelagic eggs, larvae are carried to inshore marshes via currents. Juveniles spend a variable amount of time in estuarine habitat before migrating offshore (Lassuy, 1983; Ahrenholz, 1991). Menhaden selectively predate on zooplankton and phytoplankton as larvae, and then transition to non-selective filter feeders as adults (Ross, 2001).

Although many marine species are commonly found in the Alabama River as far upstream as Claiborne Lock and Dam (eg., Hogchocker, *Trinectes maculatus* (Bloch and Schneider); Southern Flounder, *Paralichthys lethostigma* Jordan and Gilbert; Striped Mullet, *Mugil cephalus* Linnaeus; Atlantic Needlefish, *Strongylura marina* (Walbaum); Boschung and Mayden, 2004), this is the first record of Gulf Menhaden in this portion of the Alabama River. Our objective is to report the numbers of individuals and collection localities of Gulf Menhaden collected in the Alabama River during a 2010 survey.

MATERIALS AND METHODS

Nineteen sand/ gravel bars were sampled from river mile 22.9 – 72 during June-August and October 2010 (Fig. 1; Appendix). Fishes were collected on these habitats using 30, 15, and 9 m seines (5-10 efforts per site). The length of each haul was dictated by depth of the reach and presence of obstructions, but generally ranged between 30 - 100 m. Selected sites were re-sampled at night and during the fall to document diurnal and seasonal assemblage changes (41 samples total). Species that were easily identified and those of conservation concern were returned to the river. Others were preserved and taken back to the lab for identification. These specimens were anesthetized in MS 222 (tricaine methanesulfonate) and preserved in a 10% formalin solution.

Due to the extremely high numbers of Gulf Menhaden collected, subsampling was used to approximate total numbers per haul. In these circumstances Gulf Menhaden were distributed evenly in a square and divided into proportionate fractions until a reasonable subsample could be counted. Subsamples ranged from 1/4 to 1/64 of the total catch. Standard length (SL) of preserved specimens was measured in millimeters (mm) to assess age structure.

RESULTS AND DISCUSSION

Gulf Menhaden were collected at 12 of 19 sites during our survey (Table 1). The species was absent from the lowermost sample sites of our survey (Fig. 1; Table 1).

Numbers of individuals ranged from 1 to over 144,000 and was greater during the fall sample, likely related to lower water levels. Gulf Menhaden were also present in night samples (Table 1).

Lengths of Gulf Menhaden suggest that two age classes were present in the summer samples. While most individuals were age 0 (mean = 54 mm SL, n = 94), larval specimens were also collected in summer samples (mean = 21 mm SL, n = 13). These lengths fall into year classes described by Lassuy (1983). While the age 0 class also dominated fall samples, larger individuals (90-100 mm SL) were present in small numbers (n = 10). These larger individuals either grew to this size class over this summer or were missed in earlier samples.

The presence of extremely large numbers of Gulf Menhaden upstream to river mile 72 in the Alabama River is clearly a rare occurrence. It is possible that inshore movement was a result of some stimulus in their typical marine habitat. Although the timing and length of use of marsh habitat is labile for this species, certainly by fall these individuals should have migrated offshore for spawning (Fore and Baxter, 1972). The presence of very small individuals may be an indication that Gulf Menhaden spawned in the Alabama River. By 21 mm SL, individuals ordinarily move into marsh habitat using offshore currents (Christmas et al., 1982; Ross, 2001; Vaughan et al. 2000).

Predicting the impact of such large numbers of planktivorous fish on the ecosystem of the Alabama River is difficult, and should be the topic of future work. Of special concern is their impact on other filter feeding fishes, including Alabama Shad. If large numbers of this species persist in the river, there will undoubtedly be an impact on the existing food web. Our future work is aimed at monitoring the potential migration, abundance, and distribution of Gulf Menhaden in the Alabama River, as well as monitoring the entire fish assemblage.

ACKNOWLEDGMENTS

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TABLE 1. Number of Gulf Menhaden collected in sand/gravel bar samples in the Alabama River in 2010. Site numbers correspond to locality data in the Appendix and to the map (Fig. 1).

Site #	Number of individuals			
	Summer		Fall	
	Day	Night	Day	Night
1	5,649	8,159	18,590	493
2	8	-	-	-
3	1	-	-	-
4	4	1	144,464	29,776
5	0	-	109,052	-
6	1	-	-	-
7	1,200	-	-	-
8	321	0	0	-
9	12,279	0	420	71
10	0	0	0	36
11	14	-	14,067	-
12	0	-	690	-
13	808	-	2,472	-
14	29,195	-	-	-
15	8,520	-	-	-
16	2,616	-	-	-
17	0	-	-	-
18	0	-	-	-
19	0	-	-	-

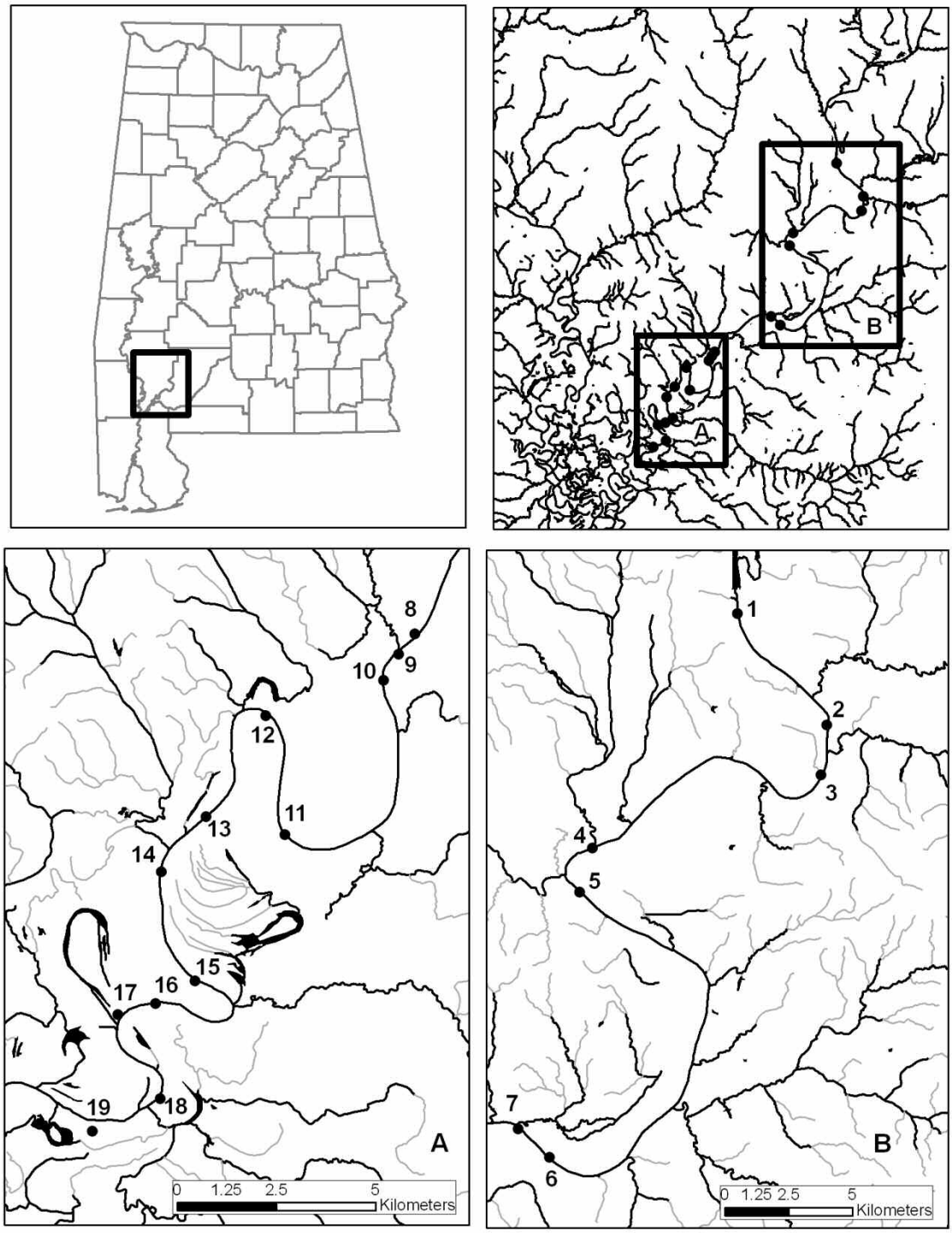

FIGURE 1. Collection sites in the Alabama River, Alabama. Site numbers correspond to locality data in the Appendix.

Appendix. Sites sampled in the Alabama River.

Site	Latitude	Longitude	Al River Mile	Site Description	Date
1	31.606766	87.550967	72	Sandbar directly below Claiborne Dam	6/28/10
1a	31.608425	87.551257	72.1	Sandbar directly below Claiborne Dam	7/8/10
1b	31.607965	87.551087	72	Sandbar directly below Claiborne Dam	7/27/10
1c	31.607564	87.550947	72	Sandbar directly below Claiborne Dam	10/14/10
1d	31.608583	87.550989	72	Sandbar directly below Claiborne Dam	10/15/10
2	31.567631	87.513743	68.3	Sandbar downriver of paper plant	6/28/10
2a	31.567598	87.513762	68.3	Sandbar downriver of paper plant	7/8/10
3	31.549879	87.516141	66.9	Directly above Hwy 84 bridge	7/8/10
3a	31.547998	87.517645	66.7	Directly below Hwy 84 bridge, small sand bar between jetties	7/8/10
4	31.523702	87.610241	60	3 pile Jetty's gravel bar near Nancy Hill Landing across from Pigeon Creek	7/8/10
4a	31.523725	87.610925	60	3 pile Jetty's gravel bar near Nancy Hill Landing across from Pigeon Creek	8/2/10
4b	31.523681	87.610989	60	3 pile Jetty's gravel bar near Nancy Hill Landing across from Pigeon Creek	10/14/10
4c	31.523841	87.610255	60	3 pile Jetty's gravel bar near Nancy Hill Landing across from Pigeon Creek	10/15/10
5	31.508194	87.615469	58.3	Mrs. Grey's Bar right bank (downriver)	7/8/10
5a	31.50848	87.615571	58.3	Mrs. Grey's Bar right bank (downriver)	10/14/10
6	31.414326	87.627276	47	Sandbar divided by jetties between Shackleford Bar and English Landing	7/26/10
6a	31.416228	87.630366	47	Sandbar divided by jetties between Shackleford Bar and English Landing	7/26/110
7	31.424393	87.640235	46.4	Sandbar / Disposal area between Frenchs Landing and English Landing	7/26/10
8	31.382167	87.717499	40.3	Sandbar across and downriver from Euryka Landing (near Irvin Creek)	7/9/10
9	31.377482	87.721757	39.6	Sandbar near Irvin Creek (Directly above mouth of creek)	7/26/110

Appendix, cont.

9a	31.380454	87.718138	39.6	Sandbar near Irvin Creek (Directly above mouth of creek)	8/9/10
9b	31.380648	87.717944	39.6	Sandbar near Irvin Creek (Directly above mouth of creek)	8/10/10
9c	31.379762	87.718719	39.6	Sandbar near Irvin Creek (Directly above mouth of creek)	10/15/10
9d	31.379856	87.718624	39.6	Sandbar near Irvin Creek (Directly above mouth of creek)	10/16/10
10	31.371523	87.725739	39.3	Sandbar downriver and opposite of Irvin Creek	7/9/10
10a	31.369525	87.726053	39.2	Sandbar downriver and opposite of Irvin Creek	8/10/10
10b	31.369839	87.7261	39.2	Sandbar downriver and opposite of Irvin Creek	8/10/10
10c	31.370694	87.726122	39.2	Sandbar downriver and opposite of Irvin Creek	10/15/10
10d	31.370718	87.726146	39.2	Sandbar downriver and opposite of Irvin Creek	10/16/10
11	31.336299	87.75164	35.4	Sandbar above (upriver) Choctaw Bluff	7/9/10
11a	31.336819	87.752356	35.4	Sandbar above (upriver) Choctaw Bluff	10/15/10
12	31.363272	87.756877	33.3	Sandbar across Choctaw Bluff (east bank)	7/9/10
12a	31.363176	87.755872	33.3	Sandbar across Choctaw Bluff (east bank)	10/16/10
13	31.340333	87.772578	31.6	Sandbar (Island) ≈ 1.3mi below Choctaw Bluff	7/27/10
13a	31.3396	87.77209	31.6	Sandbar (Island) ≈ 1.3mi below Choctaw Bluff	10/16/10
14	31.327761	87.784254	29.9	Sandbar 0.8mi down from Matthewsons Bar	7/27/10
15	31.303009	87.775094	28.4	Sandbar upriver of Dixie Landing	7/27/10
16	31.297774	87.785475	26.3	Sandbar near Dixie Cutoff and Monroe Point	7/27/10
17	31.295258	87.795414	25.5	Sandbar Below Monroe Point	8/2/10
18	31.276208	87.78405	24	Alabama River Sandbar	8/2/10
19	31.26872	87.802023	22.9	Sandbar @ Earl Bar	8/2/10